

Japanese Nuclear Incident – Radiation Data Measured in North Carolina Summary of April 12, 2011

Overview: As indicated by the March 28, press release from the N.C. Department of Environment and Natural Resources, trace amounts of radioactivity have been measured in North Carolina in the past several weeks originating from the nuclear incident at the Fukushima Daiichi Nuclear Power Plant in Japan. Reports of similar amounts of radiation have also been reported nationwide in air samples and samples of other environmental media.

Radiation detected in North Carolina: In North Carolina, this radioactivity was first reported in air samples collected during the week of March 21-28, at nuclear power plants owned and operated by Duke Energy and Progress Energy. The Radiation Protection Section (RPS) of the N.C. Division of Environmental Health confirmed these positive results in air samples collected at sites near the nuclear power plants. Since these first positive results were found, a continuing trend of small but detectable levels in non-natural radioactivity has been noted.

Overview of increased monitoring: As a result of this ongoing event, the RPS has increased both the frequency and amount of samples it collects. Samples collected by RPS have been analyzed by the State Laboratory of Public Health and by a private contractor laboratory. The RPS has modified its environmental sampling program as outlined below. Please note that this is an ongoing response and is subject to change at any time.

- Air Particulate – Continuous monitoring, collected daily or weekly depending on location and sampling method
- Air Radioiodine – Continuous monitoring with sample media specifically engineered to detect airborne radioactive isotopes of iodine, such as Iodine-131 (I-131)
- Milk – daily sampling from both large milk processors and small dairies. Samples are collected statewide for Radiation Protection by the Dairy Protection Branch, Division of Environmental Health. Samples are also collected at dairies within the nuclear power plants' Emergency Planning Zones.
- Surface Water – Both continuous and grab samples are being collected statewide and around nuclear power plants. Surface water samples are collected at least every 48 hours.
- Drinking Water – Multiple drinking water samples from public water supplies statewide are being collected at least weekly.
- Precipitation – Multiple collections at least weekly depending on rain events at the collection sites.
- Vegetation – Multiple terrestrial vegetation samples from locations statewide are being collected at least weekly. Terrestrial vegetation is defined as any vegetation that might be eaten by livestock.
- Sewage Effluent – Sewage effluent samples from treatment plants are being collected weekly.
- Shellfish – Shellfish samples are collected every two weeks.

Summary of results to date (4/12/2011): The primary non-natural radioisotope detected thus far is I-131. It is not encountered in nature and is a product of the nuclear fission (“splitting the atom”) of uranium and trans-uranic elements. I-131 has an eight-day half-life and is primarily a danger to the thyroid gland in humans. Small amounts of Cesium-137 (Cs-137) have also been detected. Cs-137 is also produced as a result of nuclear fission. The long half-life of Cs-137 (approximately 30 years) and the small amounts detected may indicate that this radioisotope was generated by past nuclear events, such as atmospheric weapons testing or the Chernobyl event. Below, you will find a summary of positive detections of radioactivity related to the Japanese nuclear event in samples collected in North Carolina to date – April 12.

NOTE ON UNITS: All measurements of radioactivity are given in picocuries/cubic meter (air samples), picocuries per liter (water or milk), or picocuries per gram (vegetation). These measurements are abbreviated as pCi/m³, pCi/l and pCi/kg. One picocurie is a trillionth (10^{-12}) of a Curie – a common unit used for radioactivity. One curie of radiation is roughly the radioactivity in one gram of Radium-226. The international unit of radioactivity is the Becquerel, which is equal to 2.7×10^{-11} curies.

- Air Particulate – Gross beta analysis of air particulate filters is currently trending at 10 times the natural radiation background average – 0.1-0.3 pCi/m³ versus the routine natural levels of 0.01-0.03 pCi/m³. These levels are below the RPS investigation level of 0.5 pCi/m³ and the regulatory limit of 1.0 pCi/m³. The “investigation level” is defined as a level of radioactivity above which further analyses are required to determine all sources present in a sample. This level is set based on instrumentation detection limits and natural background levels.
- Air Radioiodine – Gamma isotopic analyses of radioiodine samples is currently trending between 0.05 pCi/m³ and 0.2 pCi/m³. The RPS investigation level for I-131 is 0.1 pCi/m³, and the regulatory limit is 200 pCi/m³.
- Milk – Gamma isotopic analyses of milk samples is currently trending between 9 pCi/l and 10 pCi/l for I-131. For comparison purposes, a naturally occurring isotope Potassium-40 was also detected and found at a range of 1000-1500 pCi/l. If the level of I-131 in milk exceeds the investigation level of 10 pCi/l, RPS will have the milk sample analyzed for Strontium-90 (Sr-90). To date, no Sr-90 has been detected in milk samples.
- Precipitation – Small amounts of I-131 have been detected in multiple locations statewide with a range of less than one to 172 pCi/m². The median level of I-131 for these samples is approximately 35 pCi/m². [The wide range of analysis results is primarily due to the variability of rain events.] The levels of natural radioisotopes such as Beryllium-7 are present in comparable amounts. The RPS does not have a routine investigation level for gamma-isotopic detections of specific radioisotopes like I-131 in precipitation. Typically, precipitation is screened for gross alpha and gross beta radiation. If the gross beta level exceeds 10 pCi/m², gamma-isotopic analysis is then performed on the sample. However, the RPS elected to perform gamma-isotopic analyses on precipitation samples for the duration of the Japanese nuclear event.
- Vegetation – Trace amounts of Cs-137 and I-131 were detected in several vegetation samples in amounts ranging from 0.1-0.3 pCi/g for I-131 and 0.02-0.05 pCi/g for Cs-137. All I-131 and Cs-137 measurements for vegetation samples were well below the RPS investigation level of 10 pCi/g.
- Surface Water, Drinking Water, Sewage Effluent and Shellfish – No I-131 or other fission products have been detected to date. The RPS investigation level for I-131 in surface water is 1 pCi/l, and the regulatory limit is 1000 pCi/l. No specific investigation levels for I-131 have been set by the RPS for drinking water, sewage effluent or shellfish. Surface water, drinking water, shellfish and sewage effluent are analyzed for radioisotopes via gamma isotopic analyses, and no further analyses are required to detect fission products. The regulatory limit for I-131 in drinking water is 3 pCi/l.

Anticipated Health Effects of Exposure to Detected Radiation Levels from the Japan Incident:

None. The levels of radioactivity detected to date in samples collected in North Carolina are at trace levels. The Radiation Protection Section will continue its increased monitoring protocol and report the results via the Internet for the duration of the event.